COSMIC

Monthly Report

FEBRUARY 1994

THE UNIVERSITY OF GEORGIA

COMPUTER SOFTWARE MANAGEMENT

AND

INFORMATION CENTER

MONTHLY PROGRESS REPORT

FEBRUARY, 1994

UNDER CONTRACT

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PREPARED FOR

TECHNOLOGY UTILIZATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D.C.

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1. GENERAL INFORMATION

COSMIC exhibited at the Dual-Use Space Technology Conference at Johnson Space Center in Houston, Texas. This two plus day meeting attracted over 200 people to the COSMIC exhibit, part JSC employees and contractors and part attendees.

The Director also visited the JSC TU Office and the Stennis TU Office on the same trip.

In March, COSMIC will attend the RIG Meeting at Johnson Space Center.

2. INVENTORY

The current inventory of programs available from COSMIC is the sum of the Class 1 and 2 programs in TABLE 1, "Issuability Status Summary." The total number of items submitted from each source since COSMIC began is given in the right hand column of TABLE 1. Numbers listed under the "Withdrawn" column reflect those packages for which return or discard authorization has been provided by the appropriate Technology Utilization Office.

TABLE 1. ISSUABILITY STATUS SUMMARY

July 1966 to Date

Center Mnemonic	Class 1	Class 2	Class 3	Class 4	In Process	With-drawn	Total
ARC	74	5	5	4	6	86	180
COS	-	28	2	2	2	87	121
DOD	-	14	4	0	0	84	102
ERL	4	0	0	0	0	16	20
FRC	1	0	2	0	0	12	15
GSC	87	1	14	11	15	345	473
HQN	19	3	8	2	1	90	123
KSC	7	1	19	2	1	91	121
LAR	169	7	39	17	18	270	520
LEW	113	9	101	19	21	203	466
MFS	48	6	83	8	15	1,269	1,429
MSC	88	14	24	22	11	1,039	1,198
NPO	112	2	26	33	15	414	602
NUC	0	1	2	0	0	72	75
SSC	4	0	1	0	0	0	5
UGA	-	4	2	0	0	13	19
TOTALS	726	95	332	120	105	4,091	5,469

The number of submittals for the current month is below the average of the past few months. The total number of receipts for this month is eight: seven are initial packages and one is an update to a package. A summary by submittal site is shown in TABLE 2.

TABLE 2. SUMMARY OF TOTAL RECEIPTS 1994

Submittal Site	This Month	Calendar Year to Date
ARC	0	1
COS	0	1
DOD	0	2
ERL (SSC)	0	0
GSC	2	4
HQN	0	0
KSC	0	0
LAR	4	7
LEW	0	1
MFS	0	2
MSC	1	5
NPO	1	2
UGA	0	0
TOTAL	8	25

3. EVALUATION AND PUBLICATION

The program processing activities can be viewed as a three step process, although the steps are not necessarily done in sequence. These steps are program verification, program evaluation, and abstract preparation and publication.

Program verification represents the machine processing phase of evaluation and typically includes the compilation or assembly of supplied code using standard programming language translators followed by loading or linkage editing of the generated object code to insure completeness of the submitted code. This month COSMIC processed ten programs through verification.

Program evaluation involves the review of programs and supporting documentation following the machine processing phase to determine their suitability for public release relative to the standards of completeness and content specified in the COSMIC Submittal Guidelines. Prices for distributed materials are also established during package evaluation. Factors considered in establishing the price charged for program code include the program source instruction counts as a gross measure of development effort, the machine independence or vintage, the quality of the supporting documentation, the known or assumed sales potential for the package, the functionality of the program relative to comparably classified packages, and the demonstrated level of developer programming support.

Sixteen programs completed the evaluation activity for the current month. Three were class 1, two were class 2, nine were class 3, and two were class 4.

TABLE 3. SUMMARY EVALUATION TOTALS January, 1994 To Date

Submittal Site	Class 1	Class 2	Class 3	Class 4
ARC	0	0	1	1
COS	-	0	0	0
DOD	-	2	0	0
ERL	0	0	0	0
FRC	0	0	0	0
GSC	1	0	1	0
HQN	0	0	0	1
KSC	0	0	0	0
LAR	3	0	2	0
LEW	0	0	1	0
MFS	0	0	0	0
MSC	0	0	4	0
NPO	0	0	1	0
SSC	0	0	0	0
NUC	0	0	0	0
UGA	-	0	0	0
TOTALS	4	2	10	2

Publication activities carried out by COSMIC include the preparation of descriptive abstracts for all new submittal and updated Class 1 and 2 items evaluated each month as well as the preparation of Tech Briefs for the Class 1 packages for publication in the NASA Tech Brief Journal. Three Tech Briefs were prepared this month.

LAR-15226 - CWG - Mutual Coupling Program for Circular Waveguide-fed Aperture Array (IBM PC Version)

LAR-15230 - HZEFRG1 - Semiempirical Nuclear Fragmentation Model

LAR-15236 - CWG - Mutual Coupling Program for Circular Waveguide-fed Aperture Array (VAX VMS Version)

CWG - MUTUAL COUPLING PROGRAM FOR CIRCULAR WAVEGUIDE-FED APERTURE ARRAY

Mutual Coupling Program for Circular Waveguide-fed Aperture Array (CWG) was developed to calculate the electromagnetic interaction between elements of an antenna array of circular apertures with specified aperture field distributions. The field distributions were assumed to be a superposition of the modes which could exist in a circular waveguide. Various external media were included to provide flexibility of use, for example, the flexibility to determine the effects of dielectric covers (i.e., thermal protection system tiles) upon the impedance of aperture type antennas.

The impedance and radiation characteristics of planar array antennas depend upon the mutual interaction between all the elements of the array. These interactions are influenced by several parameters (e.g., the array grid geometry, the geometry and excitation of each array element, the medium outside the array, and the internal network feeding the array.) For the class of array antenna whose radiating elements consist of small holes in a flat conducting plate, the electromagnetic problem can be divided into two parts, the internal and the external. In solving the external problem for an array of circular apertures, CWG will compute the mutual interaction between various combinations of circular modal distributions and apertures.

CWG computes the mutual coupling between various modes assumed to exist in circular apertures that are located in a flat conducting plane of infinite dimensions. The apertures can radiate into free space, a homogeneous medium, a multilayered region or a reflecting surface. These apertures are assumed to be excited

by one or more modes corresponding to the modal distributions in circular waveguides of the same cross sections as the apertures. The apertures may be of different sizes and also of different polarizations. However, the program assumes that each aperture field contains the same modal distributions, and calculates the complex scattering matrix between all mode and aperture combinations. The scattering matrix can then be used to determine the complex modal field amplitudes for each aperture with a specified array excitation.

CWG is written in VAX FORTRAN for DEC VAX series computers running VMS (LAR-15236) and IBM PC series and compatible computers running MS-DOS (LAR-15226). It requires 360K of RAM for execution. To compile the source code for the PC version, the NDP Fortran compiler and linker will be required; however, the distribution medium for the PC version of CWG includes a sample MS-DOS executable which was created using NDP Fortran with the -vms compiler option. The standard distribution medium for the PC version of CWG is a 3.5 inch 1.44Mb MS-DOS format diskette. The standard distribution medium for the VAX version of CWG is a 1600 BPI 9 track magnetic tape in DEC VAX BACKUP format. The VAX version is also available on a TK50 tape cartridge in DEC VAX BACKUP format. Both machine versions of CWG include an electronic version of the documentation in Microsoft Word for Windows format. CWG was developed in 1993 and is a copyrighted work with all copyright vested in NASA.

CWG - MUTUAL COUPLING PROGRAM FOR CIRCULAR WAVEGUIDE-FED APERTURE ARRAY

SUBMITTED BY -

M.C. BAILEY

NASA LANGLEY RESEARCH CENTER

INQUIRIES CONCERNING THIS PROGRAM SHOULD BE ADDRESSED TO -

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382 EAST BROAD STREET

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HZEFRG1 - SEMIEMPIRICAL NUCLEAR FRAGMENTATION MODEL

The high charge and energy (HZE), Semiempirical Nuclear Fragmentation Model, HZEFRG1, was developed to provide a computationally efficient, user-friendly, physics-based program package for generating nuclear fragmentation databases. These databases can then be used in radiation transport applications such as space radiation shielding and dosimetry, cancer therapy with laboratory heavy ion beams, and simulation studies of detector design in nuclear physics experiments. The program provides individual element and isotope production cross sections for the breakup of high energy heavy ions by the combined nuclear and Coulomb fields of the interacting nuclei.

The nuclear breakup contributions are estimated using an energy-dependent abrasion-ablation model of heavy ion fragmentation. The abrasion step involves removal of nucleons by direct knockout in the overlap region of the colliding nuclei. The abrasions are treated on a geometric basis and uniform spherical nuclear density distributions are assumed. Actual experimental nuclear radii obtained from tabulations of electron scattering data are incorporated. Nuclear transparency effects are included by using an energy-dependent, impact-parameter-dependent average transmission factor for the projectile and target nuclei, which accounts for the finite mean free path of nucleons in nuclear matter. The ablation step, as implemented by Bowman, Swiatecki, and Tsang (LBL report no. LBL-2908, July 1973), was treated as a single-nucleon emission for every 10 MeV of excitation energy. Fragmentation contributions from electromagnetic dissociation (EMD) processes, arising from the interacting Coulomb fields, are estimated by using the Weiszacker-Williams theory, extended to include electric dipole and electric quadrupole contributions to one-nucleon removal cross sections.

HZEFRG1 consists of a main program, seven function subprograms, and thirteen subroutines. Each is fully commented and begins with a brief description of its functionality. The inputs, which are provided interactively by the user in response to on-screen questions, consist of the projectile kinetic energy in units of MeV/nucleon and the masses and charges of the projectile and target nuclei. With proper inputs, HZEFRG1 first calculates the EMD cross sections and then begins the calculations for nuclear fragmentation by searching through a specified number of isotopes for each charge number (Z) from Z=1 (hydrogen) to the charge of the incident fragmenting nucleus (Zp). After completing the nuclear fragmentation cross sections, HZEFRG1 sorts through the results and writes the sorted output to a file in descending order, based on the charge number of the fragmented nucleus. Details of the theory, extensive comparisons of its predictions with available experimental cross section data, and a complete description of the code implementing it are given in the program documentation.

HZEFRG1 is written in ANSI FORTRAN 77 to be machine independent. It was originally developed on a DEC VAX series computer, and has been successfully implemented on a DECstation running RISC ULTRIX 4.3, a Sun4 series computer running SunOS 4.1, an HP 9000 series computer running HP-UX 8.0.1, a Cray Y-MP series computer running UNICOS, and IBM PC series computers running MS-DOS 3.3 and higher. HZEFRG1 requires 1Mb of RAM for execution. In addition, a FORTRAN 77 compiler is required to create an executable. A sample output run is included on the distribution medium for numerical comparison. The standard distribution medium for this program is a 3.5 inch 1.44Mb MS-DOS format diskette. Alternate distribution media and formats are available upon request. HZEFRG1 was completed in 1992.

HZEFRG1 - SEMIEMPIRICAL NUCLEAR FRAGMENTATION MODEL

SUBMITTED BY -

L.W. TOWNSEND

J.W. WILSON

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4. MARKETING

The marketing activities performed by COSMIC involve: promotion of COSMIC and computer programs available from COSMIC in the technical press and trade journals; attendance at trade shows and professional society meetings to promote the services and software available from COSMIC; utilization of various media for the general promotion of COSMIC; utilization of benefits analysis reports to highlight COSMIC's technology transfer function; and preparation of abstract collections and program summaries.

COSMIC exhibited at the Dual-Use Conference at the Johnson Space Center in Houston, Texas. Visits with the RBSE group (University of Houston, Clear Lake), Mid-Continent RTTC, and JSC TU Office were made on the same trip.

COSMIC also visited the Stennis Space Center TU Office in February.

The calendar of events follows.

March 23-25, 1994 **RIG Meeting**, Houston, Texas

COSMIC: Attend (Scott Clark)

March 29, 1994 **National Information Infrastructure**, Washington, DC

COSMIC: Attend (John Gibson)

April 25-29, 1994 **NASTRAN Users' Colloquium**, San Diego, CA

Meeting Contact: Shirley Sanders

COSMIC: Host

June 27-29, 1994 **T^2S Annual Meeting**, Huntsville, AL

Meeting Contact: Dick Snow

COSMIC: Attend

Oct. 4-6, 1994 **UNIX Expo**, New York, NY

COSMIC: Exhibit

Nov. 8-10, 1994 **Technology 2004**, Washington, DC

COSMIC: Exhibit

5. CUSTOMER SERVICE

Customer Service provided by COSMIC, in addition to the distribution of program code and documentation, includes responding to requests for information. These requests may be in the form of telephone calls, letters, Tech Briefs cards, mini-brochure cards, trade show return cards, or magazine inquiry cards. Generally the requested information concerns the services provided by COSMIC, or information on specific programs or groups of programs which may be available from COSMIC. This month, a total of 1945 information requests were processed. This was divided into 1886 domestic requests and 59 international requests. Of the domestic requests, 464 were responses to Tech Briefs and 108 were responses to press releases and paid ads, and 170 free catalogs were sent to card deck announcements (paid) and trade show visitors. In addition to the above, E-Mail new program announcements were sent to E-Mail subscribers, and there were 400 sessions on the COSLINE information system, 1681 sessions from 445 unique machines on Worldwide Web, and 6097 sessions from 1859 machines on Gopher. Customers also downloaded 175 catalogs from listserv and Gopher services.

One other area of customer service is the response to requests for information relevant to problems associated with a particular program product installation. These requests are usually handled jointly with the Technical Service staff. After the customer problems have been resolved, a Problem Report Sheet is processed and added to the program package file for future reference. No problem reports were processed this month.

During the current month, a total of 140 customers representing 123 organizations received materials (program, documentation, or catalogs) from COSMIC. Customers represent individuals, whereas, organizations represent corporations or institutions. These customers are located in 20 different states or territories. Both NASA and non-NASA disseminations are reflected in these statistics.

6. BENEFITS IDENTIFICATION

COSMIC follows an active campaign of interviewing previous customers in order to ascertain the utility of distributed programs and identify specific benefits accruing to users of these programs. Additionally, contact with customers is used to evaluate the services provided by COSMIC. When notable benefits are identified, they are documented in reports written by COSMIC staff which are then approved for public release by the customers. No benefits report was released for publication this month.

7. MAINTENANCE AND SUPPORT

FEBRUARY PROGRESS REPORT FOR NASTRAN MAINTENANCE

RPK's primary goal for February was to continue to work on SPRs and to implement the in-memory data base. Work was completed on the in-memory data base capability using a PC beta test environment. Several SPRs were closed. The following is an itemization of the work accomplished during the month of February.

1. Testing and validation of the in-memory data base was completed in a PC beta-test environment. The system is now being transported to the Ultrix, HP and VAX VMS platforms. The GINO and substructure I/O are being completely replaced with code developed by RPK for the PC environment. This code will be transported to all COSMIC platforms with the exception of the IBM. The in-memory data base allows for part of open core to be used for keeping non-executive GINO files in memory. Once space in the in-memory data base is exhausted, the data will automatically be written to disk. The implementation of this feature focused on the use of direct access Fortran I/O. This capability addresses the disk management improvements requested in NCL 93-006.
2. Communications were established with IBM Kingston through the use of the COSMIC COSSACK platform. Help was provided by Tim Peacock of COSMIC to establish this link.

3. Work was begun on SPR 93-022 on the IBM at Kingston. Work on this is being done in conjunction with Gordon Everstine.

4. SPR 93-004 was closed with the permission of Myles Hurwitz, because the input data was not available and the problem could not be reproduced by other means.

5. The following SPRs were closed:

   93-004, 93-025, 93-027, 93-028, 93-029, 93-030

6. The following letters were sent to those users who have provided SPRs:

User	SPR No.	Date of letter	Status Reported
Scott Zillmer	93-025	2-18-94	Documented Corrections.
Scott Zillmer	93-020 93-026	2-21-94	Acknowledge receipt of updates for SPR 93-020. Assignment of SPR 93-026.
Bob Boroughs	93-029 93-031	2-28-94	Document Correction for SPR 93-029 and assignment of SPR 93-031.
Jay Malloy	93-028 93-030	2-28-94	Assign SPR numbers and document corrections.

7. Support was given to NASTRAN users as follows:

   a. Provided information to six (6) potential lessees.

   b. Aided eleven (11) lessees with problems that did not result in a SPR.

8. A problem was detected on the IBM system with respect to the linkage editor and the placement of common blocks within a load module. It has been determined that the IBM linkage editor has been completely rewritten. RPK has requested from IBM Kingston a manual for this new version. This problem will have to be addressed for the 1994 release.

9. Received code from Scott Zillmer of Rockwell that provides for strain output for the QUAD4 and TRIA3 elements. This will be documented as NCL 93-012 since it is not a correction to existing code but an extension to existing code. This code will be installed during March.
10. Work was begun on writing the following paper for the NASTRAN Colloquium:

    "New DMAP Capability for 1994 Release"

    This new capability was a RPK developed capability that RPK has provided and installed into the COSMIC platforms for the 1994 release.
11. The text files for the User's Manual have not been created with the updates for SPRs 93-010 and 93-011. The updates have been made to the Word Perfect files, but the procedure has not been determined to cleanly move the Word Perfect files up to the different computer platforms. RPK will use a text editor and put the changes into the text files for the 1994 releases.
12. The Givens Eigenvalue code was modified to allow for single and double precision computer platforms. This was documented as SPR 93-027.

The following tasks are defined for the month of March:

1. Continue to work on active SPRs.
2. Respond to users who call with problems.
3. Implement the in-memory data base on the Ultrix and HP platforms.
4. Identify modifications needed to allow for use of the new IBM linkage editor.
5. Implement the capability to provide strain output for QUAD4 and TRIA3 elements.
6. Continue to prepare the following reports for the NASTRAN Colloquium:

    "New DMAP capability for 1994 Release"

    "Overview of the 1994 Release"

7. Update the text files for the User's Manual for SPRs 93-010 and 93-011.
8. Make an initial proposed design for the implementation of a SPR on-line query and submittal capability (NCL 93-010). RPK would like to present this feature as being available at the Colloquium. Discussions will be needed with COSMIC personnel to determine the method of user interface with COSMIC computer(s).

If there are any questions, please call.

TABLE 4 TOTAL DISSEMINATIONS

ITEM	Current Month VOLUME	Current Month VALUE	Dec. 1, 1991 To Date VOLUME	Dec. 1, 1991 To Date VALUE
A. ITEMS INVOICED				
1. Programs	69	41,309.00	1687	1,081,996.50
2. Documentation	80	5,903.00	2882	194,204.00
3. Leases (Initial)	7	23,500.00	493	505,074.00
4. Leases (Renewals)	0	-8,016.69	194	719,783.32
5. Leases (Misc.)	0	0	0	0
6. Catalogs	5	125.00	1216	36,618.00
7. Miscellaneous	37	5,598.50	641	86,636.77
TOTAL INVOICE		$68,418.81		$2,624,312.59
B. NASA (No Charge)				
1. Programs	17	23,660.00	787	823,274.00
2. Documentation	17	1,040.00	903	48,396.00
3. Leases (Initial)	5	14,300.00	194	397,000.00
4. Leases (Renewals)	4	14,000.00	100	421,000.00
5. Leases (Misc.)	0	0	0	0
6. Catalogs	0	0	1088	27,665.00
7. Miscellaneous	0	0	20	2,670.00
TOTAL NASA		$53,000.00		$1,720,005.00
C. OTHER (No Charge)				
1. Programs	1	2000.00	116	126,075.00
2. Documentation	0	0	49	2,592.00
3. Leases	0	0	12	46,000.00
4. Catalogs	0	0	100	2,540.00
5. Miscellaneous	0	0	4	400.00
TOTAL OTHER		$2,000.00		$177,607.00
GRAND TOTAL DISSEMINATION		$123,418.81		$4,521,924.59

TABLE 5 NASTRAN DISSEMINATIONS

ITEM	Current Month VOLUME	Current Month VALUE	Dec. 1, 1991 To Date VOLUME	Dec. 1, 1991 To Date VALUE
A. ITEMS INVOICED				
1. Licenses Initial	0	0	9	30,300.00
2. Licenses Renewals	-3	-14,666.67	137	430,308.34
3. Licenses (Misc.)	0	0	0	0
4. Documentation	5	270.00	130	6,860.00
5. Miscellaneous	3	1,200.00	12	6,672.24
TOTAL NASTRAN INVOICED		$(13,196.67)		$474,140.58
B. NASA (No Charge)				
1. Licenses Initial	0	0	9	42,500.00
2. Licenses Renewals	2	8,000.00	69	270,000.00
3. Licenses (Misc.)	0	0	0	0
4. Documentation	0	0	39	2,540.00
5. Miscellaneous	0	0	0	0
TOTAL NASA NASTRAN		$8,000.00		$315,040.00
GRAND TOTAL NASTRAN		$(5,196.67)		$789,180.58

TABLE 6 DOD DISSEMINATIONS

ITEM	Current Month VOLUME	Current Month VALUE	Dec. 1, 1991 To Date VOLUME	Dec. 1, 1991 To Date VALUE
A. ITEMS INVOICED				
1. Programs	1	4,000.00	11	19,300.00
2. Documentation	1	54.00	27	1,092.00
3. Leases	0	0	12	2,400.00
TOTAL DOD		$4,054.00		$22,792.00

TABLE 7 FOREIGN DISSEMINATIONS

ITEM	Current Month VOLUME	Current Month VALUE	Dec. 1, 1991 To Date VOLUME	Dec. 1, 1991 To Date VALUE
A. ITEMS INVOICED				
1. Programs	18	22,900.00	319	432,950.00
2. Documentation	16	1,978.00	469	61,317.00
3. Leases (Initial)	1	1,000.00	46	139,850.00
4. Leases (Renewals)	2	649.98	32	175,849.98
5. Leases (Misc.)	0	0	0	0
6. Catalogs	0	0	130	7,460.00
7. Miscellaneous	5	1,051.00	111	24,680.65
TOTAL FOREIGN		$27,578.98		$842,107.63

FINANCIAL STATUS

NASW 4670

FEBRUARY 1994

	CURRENT MONTH	CONTRACT TO DATE
Expense:		
Personnel	44,634.46	1,205,721.45
Staff Benefits	12,736.52	339,532.03
Travel	1,648.98	67,685.47
Equipment Purchases	0	27,613.95
Computer Time	301.01	10,260.20
Operating Expense	20,770.14	654,531.85
Program Maintenance	0	832,945.18
Overhead	19,006.11	558,030.22
Total Expense	99,097.22	3,696,320.35
Income:		
Sales Income	91,847.94	2,354,180.46
NASA Payments	31,208.33	1,561,665.99
Total Income	123,056.27	3,915,846.45
FINANCIAL STATUS:		
Income - Expense	23,959.05	219,526.10